S

ENGINEERING CHANGE NOTICE

Page 1 of 7

1. ECN 666460

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	4. USQ Required?	5. Date
Supplemental ☐ Direct Revision ☒ Change ECN ☐ Temporary ☐ Standby ☐ Supersedure ☐ Cancel/Void ☐	DL McGrew/TFRSO/R3-25/372-2296	☒ Yes ☐ No Revision TF-00-063, Rev 1	5/14/01 11/6/01

6. Project Title/No./Work Order No.	7. Bldg./Sys./Fac. No.	8. Approval Designator
Project W-314, Tank Farm Restoration and Safe Operations	N/A	ESQ

9. Document Numbers Changed by this ECN (includes sheet no. and rev.)	10. Related ECN No(s).	11. Related PO No.
See block 13a.	N/A	N/A

12a. Modification Work	12b. Work Package No.	12c. Modification Work Completed	12d. Restored to Original Condition (Temp. or Standby ECNs only)
☐ Yes (fill out Blk. 12b) ☒ No (NA Blks. 12b, 12c, 12d)	N/A	N/A Design Authority/Cog. Engineer Signature & Date	N/A Design Authority/Cog. Engineer Signature & Date

13a. Description of Change

13b. Design Baseline Document? ☒ Yes ☐ No

Block 9 continuation:
HNF-SD-W314-PDS-001 Rev 3
HNF-SD-W314-PDS-002 Rev 3
HNF-SD-W314-PDS-003 Rev 3
HNF-SD-W314-PDS-005 Rev 3

See continuation sheets for block 13a

14a. Justification (mark one)	14b. Justification Details
Criteria Change ☒ Design Improvement ☐ Environmental ☐ Facility Deactivation ☐ As-Found ☐ Facilitate Const. ☐ Const. Error/Omission ☐ Design Error/Omission ☐	This change is required to incorporate ECNs, Procedure changes, and approved scope changes. "This modification will not increase collective dose since it has no impact on radiological sources, contamination control, or shielding."

15. Distribution (include name, MSIN, and no. of copies)
See Distribution list

RELEASE STAMP
DEC 03 2001
DATE:
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4
21

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1): 666460

16. Design Verification Required	17. Cost Impact — ENGINEERING		17. Cost Impact — CONSTRUCTION		18. Schedule Impact (days)
☐ Yes	Additional ☐	$ n/a	Additional ☐	$ n/a	Improvement ☐
☒ No	Savings ☐	$	Savings ☐	$	Delay ☐

19. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 13. Enter the affected document number in Block 20.

SDD/DD	☐	Seismic/Stress Analysis	☐	Tank Calibration Manual	☐
Functional Design Criteria	☐	Stress/Design Report	☐	Health Physics Procedure	☐
Operating Specification	☐	Interface Control Drawing	☐	Spares Multiple Unit Listing	☐
Criticality Specification	☐	Calibration Procedure	☐	Test Procedures/Specification	☐
Conceptual Design Report	☐	Installation Procedure	☐	Component Index	☐
Equipment Spec.	☐	Maintenance Procedure	☐	ASME Coded Item	☐
Const. Spec.	☐	Engineering Procedure	☐	Human Factor Consideration	☐
Procurement Spec.	☐	Operating Instruction	☐	Computer Software	☐
Vendor Information	☐	Operating Procedure	☐	Electric Circuit Schedule	☐
OM Manual	☐	Operational Safety Requirement	☐	ICRS Procedure	☐
FSAR/SAR	☐	IEFD Drawing	☐	Process Control Manual/Plan	☐
Safety Equipment List	☐	Cell Arrangement Drawing	☐	Process Flow Chart	☐
Radiation Work Permit	☐	Essential Material Specification	☐	Purchase Requisition	☐
Environmental Impact Statement	☐	Fac. Proc. Samp. Schedule	☐	Tickler File	☐
Environmental Report	☐	Inspection Plan	☐		☐
Environmental Permit	☐	Inventory Adjustment Request	☐		☐

20. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number/Revision

21. *Approvals*

	Signature	Date
Design Authority	DE Bowers SS-13 (signed D.C. Bowers)	11/14/01
Cog. Eng.	DL McGrew R#-25 (signed)	11-14-01
Cog. Mgr.	KN Jordan R#-25 (signed)	11-29-01
QA	TL Bennington R3-25 (signed)	11-14-01
Safety	KA Cutforth S5-12 (signed KA Cutforth)	11-26-01
Environ.	JD Guberski R1-51 (signed)	11/14/01
Other	Ops CA Meldom R3-72 (signed C.A. Meldom)	11/14/01
	(signed) NSTL	11/14/01
	(signed) Cuneo NSSL	11/14/01

	Signature	Date
Design Agent		
PE		
QA		
Safety		
Design		
Environ.		
Other		

DEPARTMENT OF ENERGY

Signature or a Control Number that tracks the Approval Signature

ADDITIONAL

Changed HNF-SD-W314-PDS-001 as follows:

Updated the Source documentation, listed below, for Section 2 and Appendix B as applicable.

DE-AC06-96RL13200: Updated to DE-AC27-99RL14047.
HNF-IP-0842: Revised to include specific volumes and sections.
HNF-IP-0842, Volume II, Section 6.1: Updated to Rev. 0e.
HNF-IP-0842, Volume IV, Section 3.11: Updated to Rev. 4a.
HNF-SD-WM-BIO-001: Updated to HNF-SD-WM-SAR-067.
HNF-SD-WM-SAR-067: Updated to Rev. 2-E.
HNF-SD-WM-TSR-006: Updated to Rev. 2-E.
RPP-PRO-097: Updated to HNF-IP-0842, Volume IV, Section 3.14.
RPP-PRO-224: Updated to HNF-PRO-224.
RPP-PRO-233: Updated to HNF-IP-0842, Volume XI, Section 3.5.
WHC-SD-W058-FDC-001: Updated to Rev. 4.
WHC-SD-W314-DRD-001: Updated to HNF-SD-W314-DRD-001
WHC-SD-W211-TDR-001: Corrected to Rev. 0B
WHC-SD-WM-OCD-015: Corrected to Rev. 0.

Section 3 changes:
Section 3.2.5: Changed "Safety Class" to "Safety Class and Safety Significant."
Section 3.2.5.1.4: Added a * in front of "Missile (horizontal)." Added "*Note: for Safety Significant SSCs, the missile criteria does not apply" to the end of the discussion of PC3 systems.
Section 3.2.5.2.2.1: Revised in accordance with ECN 669439.
Section 3.3.3.2: Deleted requirement and add "Reserved for future use."
Section 3.3.3.3: Removed references to HNF-IP-0842, Volume IV, Sections 4.25 and 4.31.
Section 3.3.6.1.1.1: Changed "Safety Class" to "Safety Significant." Changed "Safety Class function" to "safety function."
Section 3.3.6.1.1.2: Changed "Safety Class" to "General Service." Delete second sentence.
Section 3.3.6.1.1.3: Changed"Safety Class" to "Safety Significant." Changed "Safety Class function" to "safety function."
Section 3.3.6.1.1.3.7: Added "significant" after "safety" in the first sentence.
Section 3.3.6.1.1.3.8: Changed "Safety Class" to "Safety Class or Safety Significant."
Section 3.3.6.1.1.4: Changed "Safety Class function" to "safety function."
Section 3.3.6.1.2: Changed "ex-tank intrusive" to ex-tank intrusive or waste intrusive."
Section 3.4.2: Added "After January 24, 2001 use HNF-IP-0842, Volume IV, Section 4.31, Rev. 0a" to the end of the requirement.
Section 3.7.2.1.3: Revised last sentence from "The local alarm shall stay activated until acknowledged by the operator(s)" to "The local LDSTA alarm shall stay activated until the alarm clears." and added "LDSTA" after "Local" in the functon statement.
Section 3.7.2.1.3.1: Added "LDSTA" after "local" in the first sentence.
Section 3.7.2.1.3.2: Changed from "The reset/acknowledgement of the local alarm for the encasement leak detection system shall either be from the MCS or locally at the leak detector relay cabinet" to "The reset of the local LDSTA alarm for the encasement leak detection system shall be automatic when the alarm clears."

Section 3.7.2.1.3.3: In the second bullet, removed "either at the local alarm cabinet or." In the third bullet, removed "and after the local alarm is acknowledged." and also added "LDSTA" after "local" in the requirement title, in the first sentence, and in all three bullets.
Section 3.7.6.1.3: Revised the first sentence to read, "...shall activate the local PASTA alarm."
Section 3.7.6.1.3.1: Added "PASTA" after "local" in the first sentence.
Section 3.7.6.1.3.2: Changed from "The reset/acknowledgement of the local alarm for the encasement pressure rise leak detection system shall either be from the MCS or locally at the pressure monitoring relay cabinet" to "The reset of the local PASTA alarm for the encasement pressure rise leak detection system shall be automatic when the alarm clears."
Section 3.7.6.1.3.3: In the second bullet, removed "at the local alarm cabinet." In the third bullet, removed "and after the local alarm is acknowledged." Added "PASTA" after "local" in the first sentence and in the three bullets.
Section 3.7.6.1.4.4: Changed "Safety Class" to "Safety Significant."
Section 3.7.6.1.5.4: Changed "Safety Class" to "Safety Significant."

Section 5 changes:
Section 5.2: Added "LDSTA Leak Detector Station", "PASTA Pressure Alarm Station", and "TFC Tank Farm Contractor" to the acronym list.

Appendix A:
FFBD 3.2: Revised.
FFBD 3.2.2: Revised.
FFBD 3.2.2.3: Revised.
FFBD 3.2.3: Revised.

Appendix B:
Section 3.2.5.2.2.1: Revised in accordance with ECN 669439.
Section 3.3.6.1.1.1: Changed reference from HNF-SD-WM-BIO-001 to RPP-7755.
Section 3.3.6.1.1.2: Changed reference from W-058-C1 to RPP-7755.
Section 3.3.6.1.1.3: Changed reference from HNF-SD-WM-BIO-001 to RPP-7755.
Section 3.4.1: Added "After April 20, 2001, RPP-PRO-233 is replaced by HNF-IP-0842, RPP Administration, Volume XI, Section 3.5, "Review and Approval of Documents," Rev. 0a as the TFC standard" to the end of the basis statement.
Section 3.4.2: Added "After January 24, 2001, HNF-IP-0842, RPP Administration, Volume IV, Section 4.31, "Preparation and Control Standards for Engineering Drawings," Rev. 0a is the TFC standard" to the end of the basis statement.

Changed HNF-SD-W314-PDS-002 as follows:

Updated the Source documentation, listed below, for Section 2 and Appendix B as applicable.

DE-AC06-96RL13200: Updated to DE-AC27-99RL14047.
HNF-IP-0842: Revised to include specific volumes and sections.
HNF-IP-0842, Volume II, Section 6.1: Updated to Rev. 0e.
HNF-SD-W314-TI-007: Updated to Rev. 3.
HNF-SD-WM-BIO-001: Updated to HNF-SD-WM-SAR-067.
RPP-PRO-097: Updated to HNF-IP-0842, Volume IV, Section 3.14.
RPP-PRO-224: Updated to HNF-PRO-224.
RPP-PRO-233: Updated to HNF-IP-0842, Volume XI, Section 3.5.
WHC-SD-280-FDC-001: Updated to WHC-SD-W280-FDC-001
WHC-SD-W058-FDC-001: Updated to Rev. 4.
WHC-SD-W314-DRD-001: Updated to HNF-SD-W314-DRD-001
WHC-SD-W314-TI-007: Updated to HNF-SD-W314-TI-007.
WHC-SD-WM-OCD-015: Corrected to Rev. 0.

Section 3 and 5 changes:
Section 3.2.5: Changed "Safety Class" to "Safety Class and Safety Significant."
Section 3.2.5.1.3: Added "Revisions to and investigations of existing process pits and cover blocks shall be done to PC3 requirements" to end of third paragraph.
Section 3.2.5.1.4: Added a * in front of "Missile (horizontal)." Added "*Note: for Safety Significant SSCs, the missile criteria does not apply" to the end of the discussion of PC3 systems.
Section 3.2.5.2.2.1: Revised in accordance with ECN 669439.
Section 3.3.3.2: Deleted requirement and add "Reserved for future use."
Section 3.3.6.1.1: Changed "Safety Class" to "General Service." Changed the second sentence from "The safety class function of the cover blocks and new pits is to knockdown spray and limit the release of aerosols to the atmosphere" to "The cover blocks and new pits shall be designed to PC3 criteria for NPH loadings."
Section 3.4.2: Added "After January 24, 2001 use HNF-IP-0842, Volume IV, Section 4.31, Rev. 0a" to the end of the requirement.
Section 5.2: Added "TFC Tank Farm Contractor" to the acronym list.
Appendix A:Appendix A:
FFBD 3.2: Revised.
Appendix B:
Section 3.2.5.2.2.1: Revised in accordance with ECN 669439.
Section 3.2.2.3: Updated "TWRS RPP" reference to "tank farms."
Section 3.4.1: Added "After April 20, 2001, RPP-PRO-233 is replaced by HNF-IP-0842, RPP Administration, Volume XI, Section 3.5, "Review and Approval of Documents," Rev. 0a as the TFC standard" to the end of the basis statement.
Section 3.4.2: Added "After January 24, 2001, HNF-IP-0842, RPP Administration, Volume IV, Section 4.31, "Preparation and Control Standards for Engineering Drawings," Rev. 0a is the TFC standard" to the end of the basis statement.

Changed HNF-SD-W314-PDS-003 as follows:

Updated the Source documentation, listed below, for Section 2 and Appendix B as applicable.

HNF-IP-0842: Revised to include specific volumes and sections.
HNF-IP-0842, Volume II, Section 6.1: Updated to Rev. 0e.
HNF-IP-0842, Volume IV, Section 3.11: Updated to Rev. 4a.
HNF-SD-W314-TI-007: Udated to Rev. 3.
HNF-SD-WM-BIO-001: Updated to HNF-SD-WM-SAR-067.
HNF-SD-WM-SAR-067: Updated to Rev. 2-E.
HNF-SD-WM-TSR-006: Updated to Rev. 2-E.
RPP-PRO-097: Updated to HNF-IP-0842, Volume IV, Section 3.14.
RPP-PRO-224: Updated to HNF-PRO-224.
RPP-PRO-233: Updated to HNF-IP-0842, Volume XI, Section 3.5.
WHC-SD-W058-FDC-001: Updated to Rev. 4.
WHC-SD-W314-DRD-001: Updated to HNF-SD-W314-DRD-001
WHC-SD-W314-DRD-002: Updated to HNF-SD-W314-DRD-001

Section 3 changes:
Section1.1: Deleted the fifth bullet, deleted "AP-02D" from the sixth bullet, changed the last bullet to "*244-S DCRT Bypass low point leak detection", and added "*Note: On hold pending CDR and BCR approval".
Figure 3-1: Changed "MPS" to "MCS".
Section 3.1.2: Changed "Master Pump Shutdown" to "Monitoring and Control System" and changed "HNF-SD-W314-PDS-004" to "HNF-6780".
Section 3.2.1.1.3: Added "LDSTA" after "Local" in the functon statement and also in the two following sentences..
Section 3.2.1.1.3.1: Added "LDSTA" after "local" in the first sentence.
Section 3.2.1.1.3.2: Added "LDSTA" after "local" in the first sentence (2 places)
Section 3.2.1.1.3.3: In the second bullet, removed "either at the local alarm cabinet or." In the fourth bullet, removed "and after the local alarm is acknowledged.". Also added "LDSTA after "Local" in the requirement title, in the first sentence, the first bullet, the second bullet (2 places), and the last bullet.
Section 3.2.1.1.5.4: Changed "Safety Class" to "Safety Significant."
Section 3.2.1.1.5.5: Deleted.
Section 3.2.1.1.6.4: Changed "Safety Class" to "Safety Significant."
Section 3.2.1.1.6.5: Deleted

Section 3.2.5: Changed "Safety Class" to "Safety Class and Safety Significant."
Section 3.2.5.1.4: Added a * in front of "Missile (horizontal)." Added "*Note: for Safety Significant SSCs, the missile criteria does not apply" to the end of the discussion of PC3 systems.
Section 3.2.5.2.2.1: Revised in accordance with ECN 669439.
Section 3.3.3.2: Deleted requirement and add "Reserved for future use."
Section 3.3.6.1: Changed "Safety Class" to "Safety Significant." Change "Safety Class function" to "safety function."
Section 3.3.6.2: Changed "ex-tank intrusive" to ex-tank intrusive or waste intrusive."
Section 3.3.6.1.9: Changed "Safety Class" to "Safety Significant."
Section 3.3.6.1.10S: Changed "Safety Class" to "Safety Class or Safety Significant."
Section 3.4.1: Add ed"After January 24, 2001 use HNF-IP-0842, Volume IV, Section 4.31, Rev. 0a" to the end of the requirement.
Section 5 changes:
Section 5.2: Added "LDSTA Leak Detector Station" and "TFC Tank Farm Contractor" to the acronym list

Appendix A:Appendix A:
FFBD 3.2.3: Revised.
Appendix B:
Section 3.2.5.2.2.1: Revised in accordance with ECN 669439.
Section 3.4.1: Added "After January 24, 2001, HNF-IP-0842, RPP Administration, Volume IV, Section 4.31, "Preparation and Control Standards for Engineering Drawings," Rev. 0a is the TFC standard" to the end of the basis statement.
Section 3.4.2: Added "After April 20, 2001, RPP-PRO-233 is replaced by HNF-IP-0842, RPP Administration, Volume XI, Section 3.5, "Review and Approval of Documents," Rev. 0a as the TFC standard" to the end of the basis statement.

Changed HNF-SD-W314-PDS-005 as follows:

Updated the Source documentation, listed below, for Section 2 and Appendix B as applicable.
RPP-PRO-224: Updated to HNF-PRO-224.
RPP-PRO-233: Updated to HNF-IP-0842, Volume XI, Section 3.5.
WHC-SD-W058-FDC-001: Updated to Rev. 4.
WHC-SD-W314-DRD-001: Updated to HNF-SD-W314-DRD-001

Section 3 and 5 changes:
Section 3.2.2.7: Revised in accordance with ECN 665749.
Section 3.2.5.2.2.1: Revised in accordance with ECN 669439
Section 5.2: Added "TFC Tank Farm Contractor" to the acronym list.
Appendix B:
Section 3.2.2.7: Revised in accordance with ECN 665749.
Section 3.2.5.2.2.1: Revised in accordance with ECN 669439.
Section 3.4.1: Added "After April 20, 2001, RPP-PRO-233 is replaced by HNF-IP-0842, RPP Administration, Volume XI, Section 3.5, "Review and Approval of Documents," Rev. 0a as the TFC standard" to the end of the basis statement.

DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	DL McGrew	Date
Project Title/Work Order		EDT No.
Tank Farm Restoration and Safe Operations		ECN No. 666460

Name		MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
PJ Bedell	H	G3-12	X			
TL Bennington	E	R3-25	X			
DE Bowers	H	S5-13	X			
TG Howell	E	R3-25	X			
RR Bevins	E	R3-25	X			
KA Cutforth	E	S5-12	X			
JD Guberski	E	R1-51	X			
DE Legare	E	R3-25	X			
KN Jordan	E	R3-25	X			
TJ Rettkowski	H	G3-12	X			
RI Watkins	E	S2-51	X			
DL McGrew	H	R3-25	X			
Project Library	H (3-hole punch)	R3-25	X			
JL Gilbert	E	R3-25	X			
TL Jennings	E	R2-53	X			
CA Meldrom	E	R3-73	X			
SH Pearce	E	S6-18	X			
PM Cuneo	E	R1-43	X			
RF Carlstrom	E	R1-43	X			

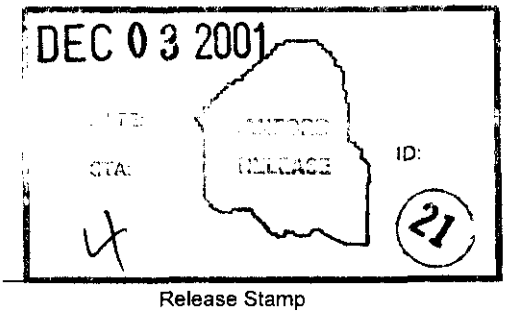
Project Development Specification for Special Protective Coating

DL McGrew
NHC
Richland, WA 99352
U.S. Department of Energy Contract DE-AC27-99RL14047

EDT/ECN: 666460 UC:
Cost Center: 7P200 Charge Code:
B&R Code: Total Pages: 40

Key Words: Project W-314, Tank Farm Restoration and Safe Operations, Valve Pits, Special Protective Coating

Abstract: Establishes the performance, design development, and test requirements for the Special Protective Coating. The system engineering approach was used to develop this document in accordance with the guidelines laid out in the Systems Engineering Management Plan for Project W-314.



11-30-01
Release Approval Date

Release Stamp

Approved For Public Release

RECORD OF REVISION

(1) Document Number: HNF-W314-PDS-005

Page _____

(2) Title: Project Development Specification for Special Protective Coating

Change Control Record

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release	
		(5) Cog. Engr.	(6) Cog. Mgr. Date
4 RS	(7) Direct Revision - ECN 666460	DL McGrew	KN Jordan 11-29-99

A-7320-005 (10/97)

Project Development Specification

for

Special Protective Coating

Project W-314
Tank Farm Restoration and Safe Operations

November 2001

Approval: K. N. Jordan, Project Manager — Date: 11-29-01

Approval: D. E. Bowers, RPP Design Authority — Date: 11/14/01

Approval: C. A. Meldrom, CHG, Project W-314 Retrieval Operations — Date: 11/14/01

Table of Contents

Appendices

List of Tables

1 SCOPE

This Project Development Specification (PDS) establishes the performance, design development, and test requirements for the Special Protective Coating (SPC). The system engineering approach was used to develop this document in accordance with the guidelines laid out in the Systems Engineering Management Plan (SEMP) for Project W-314.

New SPC will be applied to the new cover blocks provided for Valve Pits 241-AN-A and -B, 241-AW-A and -B, new AZ Valve Pit, and new Slurry Receiver Pit 241-AN-04D, as applicable. In addition, SPC will be applied to the top portion of the AZ Valve Pit walls above the stainless steel liner (i.e., cover block support ledge and above). The SPC shall be repaired where disturbed during the construction process. Additionally, the total SPC in the pits will be examined and repaired as required in the following pits:

- Valve Pits 241-AN-A and -B; 241-AW-A and -B; and 241-SY-A and -B
- Central Pump Pits 241-AY-01A and -02A; 241-AZ-01A and -02A; 241-AN-01A through -07A; 241-AP-01A through -08A; 241-AW-01A through -06A; and 241-SY-01A through -03A
- Drain Pits 241-AP-03D; 241-AW-02D; and 241-SY-02D
- Feed Pump Pits 241-AW-02E and 241-SY-02E

2 APPLICABLE DOCUMENTS

See Section 5.3 for notes regarding applicable documents.

2.1 DOE Documents

Not applicable to this specification.

2.2 Code of Federal Regulations

Not applicable to this specification.

2.3 Tank Farm Contractor Documents

HNF-IP-0842, Volume XI, Section 3.5, *RPP Administration*, "Review and Approval of Documents," Rev. 0a.

HNF-PRO-224, *Document Control Program Standards*, Rev. 3.

WHC-SD-WM-SARR-016, *Tank Waste Compositions and Atmospheric Dispersion Coefficients for Use in Safety Analysis Consequence Assessments*, Rev. 2.

2.4 Project W-314 Documents

HNF-SD-W314-QAPP-001, *Quality Assurance Project Plan (QAPP) Project W-314*, Rev. 4.

2.5 Codes and Standards

ASTM D 4060, *Abrasion Resistance of Organic Coatings by the Taber Abraser.*

ASTM D 5144, *Standard Guide for Use of Protective Coating Standards in Nuclear Power Plants.*

ASTM E-84/NFPA 255, *Standard Test Method for Surface Burning Characteristics of Building Materials.*

Factory Mutual 1-57, *Loss Prevention Data - Rigid Plastic Building Materials.*

ICRP Publication 37, *Cost Benefit Analysis in the Optimization of Radiological Protection.*

2.6 Other Documents

WAC 173-303, *Dangerous Waste Regulations*, 2000.

2.7 Drawings

Not applicable to this specification.

3 REQUIREMENTS

3.1 Item Definition

The SPC system consists of filler, joint sealant surfaces, and multiple top coats that forms a solid protective film after application. The solid film isolates the substrate from the environment, as required per WAC 173-303, and provides the decontaminability in areas of secondary confinement, such as pits, subject to radiation exposure and radionuclide contamination.

3.1.1 Item Diagrams

Not applicable to this specification.

3.1.2 Interface Definition

3.1.2.1 Functional Interface. Not applicable to this specification.

3.1.2.2 Physical Interfaces. The physical interface points are defined to be the interior surfaces of pits consisting of floors, walls, and underside of cover blocks, all exposed surfaces of the pits and cover blocks, and the nozzle locations associated with the existing piping system located within the pits. Stainless steel liners will not be coated with SPC.

3.1.3 Major Component List

Not applicable to this specification.

3.2 Characteristics

3.2.1 Performance Characteristics

The performance requirements of the SPC system are as follows:

3.2.1.1 Provide Chemical Resistance

3.2.1.1.1 Chemical Resistance. The SPC system shall be capable of withstanding the liquid waste chemical composition ranges listed in Table 3-1.

Table 3-1 Chemical Composition Range

Retrieved waste				
Species	DST		SST	
	Anion/cation		Anion/cation	
	min mol/L	max mol/L	min mol/L	max mol/L
Ag	0	0.0013	-	-
Al	0.05	1.1	0.029	0.5
As	0	0.0066	-	-
B	0	0.013	-	-

Table 3-1 Chemical Composition Range (Continued)

Retrieved waste				
Species	DST		SST	
	Anion/cation		Anion/cation	
	min mol/L	max mol/L	min mol/L	max mol/L
Ba	0	0.0004	0	0.0014
Bi	-	-	0	0.076
Ca	0.0014	0.1	0	0.17
Cd	0	0.0074	0	0.0007
Cr	0.0067	0.28	0.0001	0.091
Cu	0	0.02	-	-
Fe	0.0004	0.26	0.0057	0.89
Hg	0	2.8E-05	0	0.0001
K	0.044	0.55	0.0002	0.0095
La, Nd	0	0.0066	0	0.001
Mg	0.0004	0.046	-	-
Mn	0.0003	0.16	0.0009	0.41
Mo	0	0.0029	-	-
Na	1.6	10.7	1.6	7.1
Ni	0.0002	0.008	0	0.042
Pb	0	0.004	0	0.12
Pd, Rh	0	0.0063	-	-
Si(SiO2)	0.0024	0.028	0.0004	0.46
Ti	0	0.002	-	-
U	0	0.0092	-	-
Zr(ZrO2)	0	0.3	0	0.065
Acetate	-	-	0	0.0055
Citrate	0	0.03	0.0042	0.06
EDTA	0	0.016	0	0.011
HEDTA	0	0.021	-	-
Fe(CN)6	-	-	0	0.025
Cl	0.003	0.17	0	0.022
CO3	0.03	0.69	0.014	0.38
F	0.014	1	0.001	0.71

Table 3-1 Chemical Composition Range (Continued)

Species	Retrieved waste			
	DST		SST	
	Anion/cation		Anion/cation	
	min mol/L	max mol/L	min mol/L	max mol/L
Fission product	0	0.0001	-	-
NO2	0.1	1.8	0.0086	0.83
NOX(NO3)	0.15	3.6	0.64	5.1
OH	0.24	4.4	0.25	6.9
PO4	0	0.4	0.0007	3.8
SO4	0.003	0.16	0.01	0.22
TOC	0	2	-	-

DST = Double-shell tank
EDTA = Ethylenediametraacetic acid
HEDTA = n-(hydroxyethyl)-Ethylenediametraacetic acid
SST = Single-shell tank
TOC = Total organic carbon

3.2.1.2 Provide Decontaminability

3.2.1.2.1 Radionuclide Compatibility. The SPC system shall be compatible with the waste radionuclide concentrations listed under the W-314 column in Table 3-2.

Table 3-2 Radionuclide Concentrations

Nuclide	Nuclide Concentrations (Bq/L)		
	(a)All liquids	(a)All solids	(b)W-314
14C	2.3E+05	1.6E+05	2.3E+05
60Co	9.5E+06	4.9E+08	1.7E+08
79Se	(c)	1.7E+04	1.7E+04
90Sr	1.1E+10	2.9E+12	9.6E+11
90Y	1.1E+10	2.9E+12	9.6E+11
99Tc	1.7E+07	1.2E+10	4.0E+09
106Ru	9.9E+02	7.2E+04	2.4E+04
125Sb	3.4E+04	1.8E+08	5.9E+07
129I	2.0E+04	6.4E+06	2.1E+06
134Cs	6.1E+06	9.4E+06	7.2E+06
137Cs	8.8E+10	1.0E+11	9.2E+10

Table 3-2 Radionuclide Concentrations (Continued)

Nuclide	Nuclide Concentrations (Bq/L)		
	(a)All liquids	(a)All solids	(b)W-314
144Ce	9.1E+00	3.4E+02	1.2E+02
147Pm	3.6E+07	(c)	3.6E+07
154Eu	2.4E+09	1.1E+10	5.2E+09
155Eu	5.9E+07	5.0E+06	5.9E+07
237Np	2.3E+05	9.9E+08	3.3E+08
238Pu	1.8E+06	1.9E+08	6.4E+07
239Pu(d)	3.6E+07	1.6E+09	5.5E+08
241Pu	2.6E+08	3.8E+09	1.4E+09
241Am	4.2E+07	1.1E+10	3.7E+09
242Cm	1.1E+01	2.0E+02	7.3E+01
244Cm	4.2E+05	6.1E+07	2.0E+07

(a) From Table 1a., Van Keuren, J. C., 1996, Tank Waste Compositions and Atmospheric Dispersion Coefficients for Use in Safety Analysis Consequence Assessments, WHC-SD-WM-SARR-016, Rev. 2, Westinghouse Hanford Company, Richland, Washington.
(b) W-314 values represent a bounding mixture for design of 67% liquid and 33% solid, except for 14C and 155Eu where the maximum liquid value was used as it is higher than the mix and for 79Se and 147Pm where data is not available.
(c) No available data.
(d) The 239Pu activity concentration also includes 240Pu.

3.2.1.2.2 Decontamination Factor. The top coating of the SPC system shall demonstrate relative ease of decontamination with a minimum Decontamination Factor (DF) of 100. The DF after initial water wash shall be a minimum of 20.

3.2.2 Physical Characteristics

3.2.2.1 Surface Application. The SPC system shall develop the ability to resist the development of holidays with time.

3.2.2.2 Thermal Stress Endurance. The SPC system shall successfully fill or bridge cracks of 1.0 - 1.5 mm (0.040 - 0.060 inches) caused by thermal movement and stresses within concrete.

3.2.2.3 Volatile Organic Content Compliance. The SPC system shall be volatile organic content (VOC) compliant with a maximum VOC of 2.9 lbs/gallon (350 grams/liter).

3.2.2.4 Tensile Properties. The SPC system shall have minimum acceptable tensile properties tabulated in Table 3-3, and -4, and -5.

Table 3-3 Tensile Properties of Coatings

Properties	Rigid Coating (Epoxy)	Flexible Coating (Elastomeric)
Tensile Strength	N/A	Minimum 20,700 KPa (3,000 psi) at 30 days
Elongation at break at 24 °C (75 °F)	Minimum 5 percent	Minimum 400 percent at 30 days

Table 3-4 Tensile Properties of Joint Sealants

Properties	Flexible Epoxy	Fluoroelastomer, Polysulfide, Polyurethane
Tensile Strength	Minimum 3,500 KPa (500 psi)	Minimum 10,400 KPa (1,500 psi)
Elongation at break at 24 °C (75 °F)	Minimum 100 percent	Minimum 100 percent

Table 3-5 Tensile Properties of Fillers

Properties	Solid Epoxy Mastic
Tensile Strength	Minimum 3,500 KPa (500 psi)
Elongation at break at 24 °C (75 °F)	Minimum 20 percent

3.2.2.5 Abrasion Resistance. The top coating shall demonstrate the abrasion resistance property. The acceptable abrasion resistance values of the installed coating are tabulated in Table 3-6. The weight loss values are for 1000 cycles when a CS-17 wheel is used with a 1000 g load in accordance with ASTM D 4060.

Table 3-6 Abrasion Resistance Properties of Coatings

Properties	Rigid Coating (Epoxy)	Flexible Coating (Elastomeric)
Abrasion Resistance	Weight loss less than 100 mg	Weight loss less than 10 mg

3.2.2.6 Permeability. The SPC system shall be capable of resisting the migration of liquid waste/water into the pit wall. The permeability shall be measured as follows:

- The maximum water vapor transmission (WVT) rate for a top coating shall be 8 gm/square meter/24 hr.
- The maximum water absorption rate for a top coating and joint sealant shall be 0.5 percent

per 24 hours.

3.2.2.7 Adhesion to Substrate. The SPC system shall display an adhesion property to the underlying concrete and previously coated surfaces. Minimum pull-off strength shall be 1378 KPa (200 psi). For new concrete the minimum pull-off strength shall be 2412 KPa (350 psi). Adhesion strengths greater than 1378 KPa (200 psi) are acceptable for old concrete, and adhesion strengths greater than 2412 KPa (350 psi) are acceptable for new concrete. Existing pit interior SPC repairs are excluded from this requirement when ALARA considerations prevent surface preparation per manufacturer's recommendations.

3.2.2.8 Color. The color of the top coat shall be white or near white such that nozzle labels and markers can be painted over the top coat.

3.2.2.9 Labeling Paint. Paint (coating) use for identification marking on the SPC top coat shall be compatible with the SPC system.

3.2.3 Reliability

The SPC system shall have a design life of 12 years when installed per the manufacturer's recommendations.

3.2.4 Maintainability

The SPC system shall be repairable for cracks appearing through the applied coated surface to the substrate or for chips and flaking on account of mechanical damage.

3.2.5 Environmental Conditions

The systems and components covered by this specification shall be compatible with the environmental conditions listed below, as applicable.

3.2.5.1 Natural Environments

3.2.5.1.1 Ambient Air Temperature. The ambient air temperature range is 48.9°C (120°F) to -35.5°C (-32°F), and with a maximum 24 hour differential of 28.9°C (52°F).

3.2.5.1.2 Soil Temperature. Not applicable to this specification.

3.2.5.1.3 Seismic Loads. Not applicable to this specification.

3.2.5.1.4 Wind Loads. Not applicable to this specification.

3.2.5.1.5 Snow Loads. Not applicable to this specification.

3.2.5.1.6 Relative Humidity. The relative humidity range is 0 to 100% (Rate of change is negligible).

3.2.5.1.7 Surface Precipitation. The surface precipitation is 4 cm (1.56 in) in a 24 hour period.

3.2.5.1.8 Hail Events. The hail diameter is less than or equal to 1.9 cm (0.75 in).

3.2.5.1.9 Sand and Dust. The sand/dust concentration is 0.177 gm/cubic meter with a typical size of 350 µm.

3.2.5.1.10 Solar Radiation. The solar radiation range is between 4 Watts/square meter and 406 Watts/square meter.

3.2.5.1.11 Glaze. (See definition is Section 5.1) The glaze is 2.54 cm (1 in.).

3.2.5.1.12 Ashfall Events. Not applicable to this specification.

3.2.5.1.13 Load Combinations and Allowable Stresses. Not applicable to this specification.

3.2.5.2 Induced Environments

3.2.5.2.1 Waste Properties. Materials used that come in contact with the waste shall be capable of safely handling waste with the following properties:

Specific Gravity	1 to 1.5
Viscosity	1 to 30 centipoise (Newtonian)
Miller Number	100 Maximum
pH	7 to 14
Temperature	10 to 93 °C (50 to 200 °F)
Solids Content	30 Vol. %
Particle Size	0.5 to 4000 microns

Note: 95% of total particles 0 to 50 microns
<5 percent of total particles 50 to 500 microns
<1 percent of total particles 500 to 4000 microns

3.2.5.2.2 Radiation Tolerance

3.2.5.2.2.1 Inside Pit Radiation Level. Materials used that are located inside a pit shall be capable of operating in the following radiation environment:

3.2.5.2.2.1.1 Inside Pit Radiation Level (Non-HLW Contact).
Total accumulated dose: 1.0E+7 rads
Dose rate: 1.0E+7 mr/hr

3.2.5.2.2.1.2 Inside Pit Radiation Level (For Hardware in Contact with HLW).
Total accumulated dose: 6.0E+7 rads
Dose rate: 1.0E+7 mr/hr

3.2.5.2.2.2 Background Radiation Level. Materials used that are located outside a pit, above ground, shall be capable of operating in the following radiation environment:

total accumulated dose:	4.4 rad/year
dose rate:	0.5 mrem/hour

3.2.6 Transportability

Not applicable to this specification.

3.2.7 Flexibility and Expansion

Each system design shall, to the maximum extent practicable, provide sufficient flexibility to accommodate for programmatic changes or operation modifications.

3.3 Design and Construction

3.3.1 Materials, Processes, and Parts

3.3.1.1 Materials

3.3.1.1.1 SPC System

3.3.1.1.1.1 Service Area. The SPC system shall be suitable for Service Level II Area.

3.3.1.1.1.2 SPC System Schedule. A SPC system schedule shall be prepared during definitive design stage, based on manufacturer recommendations, published data for the SPC system and field ALARA conditions. The schedule shall provide descriptions of prime, base, intermediate, and finish coats as applicable; minimum dry film thickness in mils; and color.

3.3.1.1.2 SPC System Accessory Materials. Coating accessory materials such as joint sealants, fillers, primers, thinners, form release agents, and scrim cloth shall be as recommended by the manufacturer of the SPC system suitable for environmental conditions specified in this document.

3.3.1.2 Processes

3.3.1.2.1 Surface Preparation

3.3.1.2.1.1 Surface Preparation (Excluding Existing Pit Interior SPC Repairs). The design document will incorporate a surface preparation procedure prepared in consultation with the manufacturer of the SPC system. Substrate preparation method(s) and acceptance criteria will be selected and documented in the design media during the design phase.

3.3.1.2.1.2 Surface Preparation for Existing Pit Interior SPC Repairs. The design document will incorporate a surface preparation procedure prepared in consultation with the manufacturer of the SPC system when field radiological/toxicological conditions permit. When field radiological/toxicological conditions prohibit surface preparation per manufacturer's consultation, the design document will provide minimum surface preparation details consistent with ALARA.

3.3.1.2.2 SPC System Application. The SPC system shall be installed only when ambient and surface temperatures are within the range recommended by the coating manufacturer for the respective coating. The application procedure for the SPC system shall be in accordance with the manufacturers' specification.

3.3.1.3 Optimization. During the design of facilities, optimization principles, as discussed in ICRP Publication 37, shall be utilized in developing and justifying facility design and physical controls.

3.3.1.4 Dome Loading. The equipment used for installation and maintenance shall comply with the DST dome loading constraints.

3.3.2 Electromagnetic Radiation

Not applicable to this specification.

3.3.3 Identification and Marking

Not applicable to this specification.

3.3.4 Workmanship

Not applicable to this specification.

3.3.5 Interchangeability

Not applicable to this specification.

3.3.6 Safety

3.3.6.1 Material Safety Data Sheets. Material Safety Data Sheets (MSDS) for the SPC system components shall be furnished during the data transmittal review stage for approval. Obtain inspection and acceptance by the construction engineer before opening containers or removing labels.

3.3.6.2 Fire Protection

3.3.6.2.1 Fire Characteristics. Any materials with unusual fire characteristics, such as urethane foams, and any materials that develop significant quantities of toxic or other harmful products of combustion, shall not be used as interior finishes or other interior applications without the approval of the cognizant DOE fire protection authority. The use of foamed plastics in construction shall be prohibited unless it fully complies with Factory Mutual 1-57.

3.3.6.2.2 Interior Finishes. Nuclear facilities and laboratories shall have interior finish materials (decorations, furnishings, and exposed wall or insulating material) that have an Underwriters Laboratories (ASTM E-84/NFPA 255) flame spread rating of 25 or less, and smoke developed rating of 50 or less.

3.3.7 Human Performance/Human Engineering

Not applicable to this specification.

3.4 Documentation

3.4.1 Document Control

Records, documents, and document control pertinent to design functions shall be in accordance with HNF-PRO-224 and HNF-IP-0842, Volume XI, Section 3.5, Rev. 0a.

3.5 Logistics

3.5.1 Maintenance

Not applicable to this specification.

3.5.2 Supply

3.5.2.1 Parts and Components. The system design shall, to the greatest extent practicable, use readily available parts and components.

3.5.3 Facilities and Facility Equipment

Not applicable to this specification.

3.6 Personnel and Training

3.6.1 Personnel

Not applicable to this specification.

3.6.2 Training

Not applicable to this specification.

3.7 Major Component Characteristics

Not applicable to this specification.

4 SYSTEM QUALIFICATION PROVISIONS

4.1 General

The Project W-314 QAPP (HNF-SD-W314-QAPP-001) defines the quality assurance requirements for this project.

Table 4-1 listed verifications may be performed in conjunction with QAPP verifications. Inspections as defined in 4.2 shall be conducted during the design and development of each system to provide assurance of compliance with the requirements of this PDS.

4.1.1 Responsibility for Inspections

The design contractor shall be responsible for the performance of all inspections for each system developed in accordance with this PDS. Inspections shall be conducted at the contractor facilities or the facilities of his choice with the approval of the procuring authority. The procuring authority reserves the right to witness or perform the specified inspections.

4.1.2 Special Tests and Examinations

Not applicable to this specification.

4.2 Quality Conformance Inspections.

Qualification shall be performed on System hardware representative of the approved production design. Qualification of the System to assure compliance with the requirements of Section 3 shall be by examination, demonstration, test, and/or analysis, as defined herein. Test program data may be used to assure compliance with requirements.

a. Examination is an element of inspection consisting of investigation, without the use of special laboratory appliances or procedures, to determine compliance with requirements. This method is intended to be construction related and consists of examination of documents and construction activities.

b. Demonstration is an element of inspection that is limited to readily observable functional operation to determine compliance with requirements. This element of inspection does not require the use of special equipment or sophisticated instrumentation. This method is intended to be utilized for any mock-up testing.

c. Test is an element of inspection that employs technical means including (but not limited to) the evaluation of functional characteristics by use of special equipment or instrumentation, simulation techniques, and the application of established principles and procedures to determine compliance with requirements. The analysis of data derived from test is an integral part of this inspection. This method is intended to be utilized for any acceptance testing in the field.

d. Analysis is an element of inspection, taking the form of the processing of accumulated results and conclusions, intended to provide proof that verification of a requirement(s) has been accomplished. The analytical results may be comprised of a compilation of interpretation of

existing information or derived from lower level examinations, tests, demonstrations, or analyses.

The environmental capability of equipment shall be demonstrated by appropriate testing, analysis, and operating experience, or other methods that can be supported by auditable documentation, or a combination of these methods.

Table 4-1 Quality Conformance Inspection Matrix

Section 3 Paragraph Number	Title	Level of Assembly	Inspection Element				
			Exam	Demo	Test	Anly	N/A
3.2	Characteristics						X
3.2.1	Performance Characteristics						X
3.2.1.1	Provide Chemical Resistance						X
3.2.1.1.1	Chemical Resistance					X	
3.2.1.2	Provide Decontaminability						X
3.2.1.2.1	Radionuclide Compatibility					X	
3.2.1.2.2	Decontamination Factor					X	
3.2.2	Physical Characteristics						X
3.2.2.1	Surface Application		X			X	
3.2.2.2	Thermal Stress Endurance					X	
3.2.2.3	Volatile Organic Content Compliance					X	
3.2.2.4	Tensile Properties					X	
3.2.2.5	Abrasion Resistance					X	
3.2.2.6	Permeability					X	
3.2.2.7	Adhesion to Substrate					X	
3.2.2.8	Color		X			X	
3.2.2.9	Labeling Paint					X	
3.2.3	Reliability					X	
3.2.4	Maintainability					X	
3.2.5	Environmental Conditions						X
3.2.5.1	Natural Environments						X
3.2.5.1.1	Ambient Air Temperature					X	
3.2.5.1.2	Soil Temperature						X
3.2.5.1.3	Seismic Loads						X
3.2.5.1.4	Wind Loads						X

Table 4-1 Quality Conformance Inspection Matrix (Continued)

Section 3 Paragraph Number	Title	Level of Assembly	Inspection Element				
			Exam	Demo	Test	Anly	N/A
3.2.5.1.5	Snow Loads						X
3.2.5.1.6	Relative Humidity					X	
3.2.5.1.7	Surface Precipitation					X	
3.2.5.1.8	Hail Events					X	
3.2.5.1.9	Sand and Dust					X	
3.2.5.1.10	Solar Radiation					X	
3.2.5.1.11	Glaze					X	
3.2.5.1.12	Ashfall Events						X
3.2.5.1.13	Load Combinations and Allowable Stresses						X
3.2.5.2	Induced Environments						X
3.2.5.2.1	Waste Properties					X	
3.2.5.2.2	Radiation Tolerance						X
3.2.5.2.2.1	Inside Pit Radiation Level						X
3.2.5.2.2.1.1	Inside Pit Radiation Level (Non-HLW Contact)					X	
3.2.5.2.2.1.2	Inside Pit Radiation Level (For Hardware in Contact with HLW)					X	
3.2.5.2.2.2	Background Radiation Level					X	
3.2.6	Transportability						X
3.2.7	Flexibility and Expansion					X	
3.3	Design and Construction						X
3.3.1	Materials, Processes, and Parts						X
3.3.1.1	Materials						X
3.3.1.1.1	SPC System						X
3.3.1.1.1.1	Service Area					X	
3.3.1.1.1.2	SPC System Schedule					X	

Table 4-1 Quality Conformance Inspection Matrix (Continued)

Section 3 Paragraph Number	Title	Level of Assembly	Inspection Element				
			Exam	Demo	Test	Anly	N/A
3.3.1.1.2	SPC System Accessory Materials					X	
3.3.1.2	Processes						X
3.3.1.2.1	Surface Preparation						X
3.3.1.2.1.1	Surface Preparation (Excluding Existing Pit Interior SPC Repairs)					X	
3.3.1.2.1.2	Surface Preparation for Existing Pit Interior SPC Repairs					X	
3.3.1.2.2	SPC System Application		X			X	
3.3.1.3	Optimization					X	
3.3.1.4	Dome Loading					X	
3.3.2	Electromagnetic Radiation						X
3.3.3	Identification and Marking						X
3.3.4	Workmanship						X
3.3.5	Interchangeability						X
3.3.6	Safety						X
3.3.6.1	Material Safety Data Sheets					X	
3.3.6.2	Fire Protection						X
3.3.6.2.1	Fire Characteristics					X	
3.3.6.2.2	Interior Finishes					X	
3.3.7	Human Performance/Human Engineering						X
3.4	Documentation						X
3.4.1	Document Control		X			X	
3.5	Logistics						X
3.5.1	Maintenance						X
3.5.2	Supply						X
3.5.2.1	Parts and Components					X	

Table 4-1 Quality Conformance Inspection Matrix (Continued)

Section 3 Paragraph Number	Title	Level of Assembly	Inspection Element				
			Exam	Demo	Test	Anly	N/A
3.5.3	Facilities and Facility Equipment						X
3.6	Personnel and Training						X
3.6.1	Personnel						X
3.6.2	Training						X
3.7	Major Component Characteristics						X

5 NOTES

5.1 Definitions

5.1.1 Abrasion Resistance

The property of a surface by which it resists being worn away as the result of friction.

5.1.2 Adhesion

The bond or attraction of a coat of paint to the underlying material, such as a substrate or another coat.

5.1.3 Chip

The detachment of small pieces of the substrate.

5.1.4 Decontamination

The act of removing radioactive nuclides from a surface.

5.1.5 Decontamination Factor

The ratio of the original number of radioactive nuclides on the surface of a specimen to the number remaining after a decontamination process.

5.1.6 Dry-film Thickness

Depth of applied coating when dry, expressed in mils (0.001 in).

5.1.7 Flaking

The detachment of small pieces of the coating film.

5.1.8 Glaze

Coating of ice formed when rain or drizzle freezes on contact with any surface having a temperature that is below freezing.

5.1.9 Holiday

Pinhole, skip, discontinuity, or a void in coating film.

5.1.10 Laitance

A fine, whitish accumulation on concrete surfaces. It consists mainly of cement particles that were carried by water rising to the surface of freshly placed concrete.

5.1.11 Permeability

The measure of water or water vapor transmission rate through films of coating.

5.1.12 Service Level II Area

That area outside primary containment subject to radiation exposure and radionuclide contamination in accordance with ASTM D 5144.

5.1.13 Substrate

The base surface to which a coating is to be applied.

5.1.14 Wet-Film Thickness

Depth of applied coating expressed in mils measured immediately after application.

5.1.15 Water Vapor Transmission Rate

The steady water vapor flow in unit time through unit area of a body.

5.2 Acronym List

AIM	Architectural and Industrial Maintenance
ANSI	American National Standard Institute
ASTM	American Society for Testing and Materials
DF	Decontamination Factor
DFT	Dry Film Thickness
DOE	U.S. Department of Energy
DRD	Design Requirements Document
EPA	Environmental Protection Agency
FDNW	Fluor Daniel Northwest
MSDS	Material Safety Data Sheet
N/A	Not Applicable
NACE	National Association of Corrosion Engineers
PC	Performance Category
RPP	River Protection Project
SPC	Special Protective Coating
TFC	Tank Farm Contractor
VOC	Volatile Organic Components
WVT	Water Vapor Transmission

5.3 Applicable Documents

National codes and standards will be identified within Section 2, Applicable Documents, of the PDS without dates or revision numbers. Government documents and Hanford site standards will be identified by the effective date or revision number.

APPENDIX A

FUNCTIONAL FLOW BLOCK DIAGRAMS (FFBDs)

Not applicable to this specification.

APPENDIX B

REQUIREMENTS BASIS

Table B-1 Requirements Basis

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
3.2.3.7 Provide Chemical Resistance	3.2.1.1.1 Chemical Resistance Basis: This is the cross-site transfer system chemical composition from Internal Memo 22170-93-012, *Recommended Waste Composition Changes to the MWTF FDC*, Rev. 1, Waste Management Engineering to J. M. Light, June 23, 1993. The waste composition from the cross-site transfer system is the worst-case for the W-314 transfer piping.	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating
3.2.3.8 Provide Decontaminability	3.2.1.2.1 Radionuclide Compatibility Basis: The radionuclide concentrations in the "W-314" column in Table 3-2 represent a bounding mixture for design and were derived by assuming a mixture comprised of two-thirds of the maximum sample activity composite from the "All liquids" column and one-third of the maximum sample activity composite from the "All solids" column with the exceptions of where either a solid or liquid composite is unknown then the total of the known composite is used and for 14C and 155Eu where the maximum liquid value was used as it is higher than the mix. The "All solids" and "All liquids" columns are from WHC-SD-WM-SARR-016, *Tank Waste Compositions and Atmospheric Dispersion Coefficients for Use in Safety Analysis Consequence Assessments*, Rev. 2, Table 1a.	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
3.2.3.8 Provide Decontaminability	3.2.1.2.2 Decontamination Factor Basis: Decontaminabilty is measured by the Decontamination Factor (DF) in accordance with ASTM D 4256, *Determination of the Decontaminability of Coatings Used in Light-Water Nuclear Power Plants.* The higher the overall DF, the easier the coating will be to decontaminate. DF 100 corresponds to 99% removal of contamination which is achievable with current coating technology. A DF value of 20 is achievable with water wash and a desirable criteria in accordance with ANSI N512, *Protective Coatings (Paints) for the Nuclear Industry.* These criteria were outlined in GS09855.SP, *Chemical Resistant Decontaminable Coating Guide Specification.*	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating
	3.2.2.1 Surface Application Basis: This is a desirable characteristic of the SPC system followed industry wide in accordance with NACE RP0169, *Control of External Corrosion on Underground or Submerged Metallic Piping Systems.*	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating
	3.2.2.2 Thermal Stress Endurance Basis: ACI 224R-90, *Control of Cracking in Concrete Structures*, states that cracking, if any has occurred, results from initial shrinkage, imposed loads, thermal stresses, and from uneven settlement. ACI states that cracks from 1.0 - 1.5 mm (0.040 to 0.060 inches) can be expected from these crack producing events.	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating
	3.2.2.3 Volatile Organic Content Compliance Basis: The requirement is based on the Environmental Protection Agency (EPA) Architectural and Industrial Maintenance (AIM) Coating rules. The acceptable value is in accordance with the VOC requirements for Industrial Maintenance Coatings outlined in Appendix II of the Proposed Alternative AIM Reg/Neg Framework and Industry Caucus Response.	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	3.2.2.4 Tensile Properties Basis: The tensile strength and percent elongation at break are measures of the tensile properties of coating and sealant materials. The acceptable values are in accordance with the requirements outlined in GS09855.SP, *Chemical Resistant Decontaminable Coating Guide Specification*. The requirements are based on available data from manufacturers of the type of coatings currently used at Hanford Site.	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating
	3.2.2.5 Abrasion Resistance Basis: The SPC system on substrates can be damaged by abrasion during installation and operation. ASTM D 5144, *Standard Guide for Use of Protective Coating Standards in Nuclear Power Plants* requires that where abrasion is a factor, the coating shall demonstrate the abrasion resistance property. The acceptable values are dependent on the types of SPC systems and in accordance with the requirements outlined in GS09855.SP, *Chemical Resistant Decontaminable Coating Guide Specification*. The requirements are based on available data from manufacturers of the type of SPC systems currently used at Hanford Site.	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating
	3.2.2.6 Permeability Basis: One function of the coating is to isolate the substrate from the environment by arresting the passage of liquid. The above requirements are measure of how well the function is performed. The acceptable values are in accordance with the requirements outlined in GS09855.SP, *Chemical Resistant Decontaminable Coating Guide Specification*. The requirements are based on available data from manufacturers of the type of SPC systems currently used at Hanford Site.	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	3.2.2.7 Adhesion to Substrate Basis: ASTM D 5144, *Standard Guide for Use of Protective Coating Standards in Nuclear Power Plants* requires that the SPC system shall demonstrate the adhesion to substrate property. The acceptable minimum pull-off strength value of 1378 Kpa (200 psi) for old concrete, and the acceptable minimum pull-off strength value of 2412 Kpa (350 psi) for new concrete is based on testing data provided by RPP-7806, *Project W-314 Polyurea Special Protective Coating (SPC) Test Report Chemical Compatibility & Physical Characteristics Testing*, Rev. 0, Section "Adhesion Strength." The requirement is based upon repeated concrete failure during adhesion strength testing performed on an old unused cover block at Hanford. The concrete cover block has similar structural characteristics to the pump and valve pit concrete needing refurbishing; therefore, specifying greater adhesion strength provides no benefit to the pit SPC system. A higher adhesion strength criterion has been selected for new not previously coated concrete . The higher value is based on concrete compressive strengths of 3000 psi to 5000 psi for cast-in-place structural concretes (ASTM STP 169C, *Significance of Tests and Properties of Concrete and Concrete-Making Materials*, Page 528) and an example of Construction Requirements for Hanford Tank Farms: W-314-C6, *Project W-314 Construction Specification General Requirements 200 East Waste Transfer System*, Project Specification 134 210 03300, "Cast-in-Place Concrete," Section 2.2.1.4, Page 4 of 8. "Minimum allowable compressive strength: 4000 psi at 28 days" and "the ratio of tension to compressive strength of concrete ranges between 0.07 and 0.11" (ASTM STP 169C, Page 133). The concrete tensile strength applicable to new concrete applications is 350 psi; therefore the associated adhesion strength requirements is assigned the same value. This value was derived from a combination of nominal concrete	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	compressive and tensile strength values (3000 psi x 0.07 = 210 psi and 5000 psi x 0.11 = 550 psi). Adhesion is directly related to preparation. For repair of existing coatings on the interior of pits, the preparation required of the substrate to meet the manufacturers recommended preparation could expose workers to unacceptable radiation levels and/or possible airborne release of contamination. Preparation of the substrate must be evaluated on a pit by pit basis.	
	3.2.2.8 Color Basis: The nozzle labels and flow diagram are painted over the top coat. The flow diagram is painted on the top surface of the cover block to assist the operator in valving to the correct tank. Each nozzle in the pit is assigned an unique number which is painted on the pit wall near the nozzle to assist the operator in reconnection during the jumper change.	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating
	3.2.2.9 Labeling Paint Basis: The labeling paint must be compatible with the SPC system such that the label is visible and the paint does not degrade the effectiveness of the SPC system.	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating
	3.2.3 Reliability Basis: The life expectancy of SPC systems as claimed by manufacturers seldom exceeds 20 years in any environment. Even these claims have a qualifying requirements of being properly maintained including subsequent re-coatings with a topcoat and repair of chips and flaking. The life expectancy of SPC system in a pit at Hanford without maintenance is estimated to be around 12 years.	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	3.2.4 Maintainability Basis: The repair of cracks or chips and flaking is considered minor repair which does not involve significant areas of the SPC system.	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating
	3.2.5.1.1 Ambient Air Temperature Basis: HNF-SD-W314-DRD-001, Preliminary Design Requirements Document for Project W-314, Rev. 2, Section 3.2.4.1.1.	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating
	3.2.5.1.6 Relative Humidity Basis: HNF-SD-W314-DRD-001, Preliminary Design Requirements Document for Project W-314, Rev. 2, Section 3.2.4.1.2.	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating
	3.2.5.1.7 Surface Precipitation Basis: HNF-SD-W314-DRD-001, Preliminary Design Requirements Document for Project W-314, Rev. 2, Section 3.2.4.1.3.	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating
	3.2.5.1.8 Hail Events Basis: HNF-SD-W314-DRD-001, Preliminary Design Requirements Document for Project W-314, Rev. 2, Section 3.2.4.1.3.	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating
	3.2.5.1.9 Sand and Dust Basis: HNF-SD-W314-DRD-001, Preliminary Design Requirements Document for Project W-314, Rev. 2, Section 3.2.4.1.4.	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating
	3.2.5.1.10 Solar Radiation Basis: HNF-SD-W314-DRD-001, Preliminary Design Requirements Document for Project W-314, Rev. 2, Section 3.2.4.1.6.	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	3.2.5.1.11 Glaze Basis: The basis for this requirement is based on engineering judgement from years of experience in the area.	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating
	3.2.5.2.1 Waste Properties Basis: The waste properties are from WHC-SD-WM-DGS-006, Tank Farm Pump Critical Characteristic and Specification Guide, Rev. 0, Table 4-1 except particle size and specific gravity. Particle size basis is WHC-SD-W058-FDC-001, Functional Design Criteria for Project W-058, Replacement of the Cross-site Transfer System, Rev. 4, Section 3.2.6.5. The transfer system piping components must be compatible with transferring liquid waste with a SpG of 1.5 based on receipt of waste from Privatization per DE-AC27-01RV141368, Design, Construction, and Commissioning of the Hanford Tank Waste Treatment and Immobilization Plant, Part 1, Section C, Table TS-9.1 "Physical Requirements for Liquids or Slurries Transferred to DOE."	hsems.2.3.1.1.2.1.2.1 W-314 New and Repaired Special Protective Coating

Table B-1 Requirements Basis (Continued)

FUNCTION NUMBER AND NAME	TECHNICAL REQUIREMENTS	SYSTEM ELEMENT NUMBER
	3.2.5.2.2.1.1 Inside Pit Radiation Level (Non-HLW Contact) Basis: Total accumulated dose for inside pit non-HLW contact is 1.0E+7 rad. For a 12-year exposure period this equates to 95 r/hr. This total accumulated dose is a conservative estimate for the twelve-year life span. The basis for this requirement is derived from the analysis of all the DST pump and valve pits included in Project W-314, and finding that the highest dose rate in any of these pits during a transfer is 8.7 r/hr (Calculation W314-P-066, Calculations Shielding Analysis 241-AW-A & B Valve Pits). For conservatism assume 10 r/hr for 12 years, which is approximately 1.0E+6 rad, which is an order of magnitude lower than the requirement of 1.0E+7 rad. A second potential source of accumulated dose is from spills. It is expected that after flushing the spill residual, the contamination will be negligible and will be bound by the 1.0E+7 rad requirement. The (DF) requirement of the SPC is 99%, and the DF for the SPC polyurea ranges from 99.5% for 137-Cesium to 99.97% for 154-Europium. If the spilled waste is not allowed to dry on the surface of the polyurea Special Protective Coating (SPC) the DF is substantially larger than the range of 99.5%-99.7% (RPP-7806, Project W-314 Polyurea Special Protective Coating (SPC) Test Report Chemical Compatibility & Physical Characteristics Testing, Rev. 0).	